AMENDED CLAIMS

1. (currently amended) A method of obtaining nuclear magnetic resonance signals from a fluid obtained from an earth formation, comprising:

   (a) conveying said fluid into a nuclear magnetic resonance (NMR) sensor in a borehole in said earth formation;

   (b) enhancing a polarization of a nuclear spin of a nucleus occurring in said fluid; and

   ~~(d)~~ (c) using said NMR sensor for obtaining NMR signals from said fluid.

2. (previously presented)The method of claim 1 wherein enhancing said polarization of said nuclear spin is based at least in part on the Overhauser effect (OE).

3. (previously presented)The method of claim 1 wherein enhancing said polarization of said nuclear spin is based at least in part on the Nuclear Overhauser Effect (NOE).

4. (previously presented) The method of claim 1 wherein enhancing said polarization of said nuclear spin is based at least in part on optical pumping.

5. (previously presented) The method of claim 1 wherein enhancing said polarization of said nuclear spin is based at least in part on a Spin Induced Nuclear Overhauser

Effect (SPINOE).

6. (previously presented) The method of claim 1 wherein enhancing said nuclear spin polarization further comprises:

(i) introducing a polarizing agent into said fluid; and

(ii) polarizing a spin of said polarizing agent, and

(iii) transferring a polarization of said polarized agent to said nuclear spin.

7. (previously presented)The method of claim 1, further comprising conveying said sensor downhole on a wireline device.

8. (previously presented)The method of claim 1, further comprising conveying said sensor downhole on a measurement-while-drilling tool.

9. (previously presented) The method of claim 6, wherein said polarizing agent further comprises a noble gas.

10. (previously presented)The method of claim 9, wherein said polarizing agent further comprises xenon.

11. (previously presented) The method of claim 1, wherein said nucleus occurring in said fluid further comprises a carbon-13 nucleus present in at least one of: i) an

aliphatic hydrocarbon , ii) an aromatic hydrocarbon, , iii) a connate formation fluid, and, (iv) a mud filtrate.

12. (previously presented)The method of claim 6, wherein said polarizing said spin of said polarizing agent further comprises a spin exchange with an intermediate material.

13. (previously presented) The method of claim 12 wherein said intermediate material comprises rubidium.

14. (previously presented)The method of claim 12 further comprising irradiating said intermediate material with a laser to move electrons of said intermediate material to a higher quantum state

15. (previously presented) The method of claim 1, wherein obtaining said nuclear magnetic resonance signal

further comprises:

i) conveying said fluid within a chamber of said sensor;

ii) providing a substantially homogeneous static magnetic field in said chamber;

iii) applying a radio frequency pulse sequence to said fluid with at least one transmitter; and

iv) obtaining NMR signals from said fluid in response to said radio frequency pulse sequence at at least one receiver antenna.

16. (previously presented) The method of claim 1 wherein obtaining said NMR signals further comprises obtaining spin echo signals.

17. (previously presented) The method of claim 16 further comprising:

(i) summing amplitudes of said spin echo measurements;

(ii) spectrally analyzing said summed amplitudes;

(iii) determining whether aromatic hydrocarbons are present in said fluid sample by measuring an amplitude of said spectrally analyzed summed amplitudes at about 130 parts per million shift from a ^{13}C resonant frequency and determining whether aliphatic hydrocarbons are present in said fluid sample by measuring an amplitude of said spectrally analyzed summed amplitudes at about 30 parts per million frequency shift from said ^{13}C resonant frequency.

18. (previously presented) The method of claim 1 wherein said NMR signals comprise a free induction decay.

19. (previously presented) The method of claim 1 wherein said NMR signals are CW NMR signals to obtain frequency spectra from which chemical shift information is

obtained to analyze the chemical composition of the sample under test.

20. (previously presented) The method of claim 18 where the free induction decay is transformed into a frequency spectrum for analyzing chemical composition from the chemical shift information.

21. (previously presented) The method of claim 1 wherein said NMR signals are associated with a nuclear spin of ^{13}C.

22. (previously presented) The method of claim 15 wherein said NMR signals are associated with a nuclear spin of ^{13}C.

23. (previously presented) The method of claim 22 wherein providing said substantially homogeneous static magnetic field further comprises using additional NMR signals associated with ^{1}H.

24. (previously presented) The method of claim 15 wherein providing said substantially homogeneous static magnetic field further comprises using additional NMR signals associated with ^{1}H.

25. (previously presented) The method of claim 2 further comprising radiating RF into an ESR-active agent at an ESR frequency of said agent and thereby enhancing the

spin polarization of atomic nuclei.

26. (previously presented) The method of claim 3 further comprising changing a nuclear spin polarization of carbon-13 nuclei in said fluid by radiating RF at a NMR frequency of hydrogen nuclei.

27 – 41. Withdrawn

42. (previously presented) An apparatus for use in a borehole in an earth formation for obtaining nuclear magnetic resonance signals from a fluid obtained from said formation, comprising:

(a) a nuclear magnetic resonance sensor;

~~(c)~~(b) a device for enhancing a polarization of a nuclear spin of a nucleus occurring in said fluid; and

~~(d)~~(c) a processor for analyzing NMR signals obtained by said NMR sensor from said fluid.

43. (previously presented) The apparatus of claim 42 wherein said device for enhancing said polarization of said nuclear spin uses the Overhauser effect (OE).

44. (previously presented) The apparatus of claim 42 wherein said device for enhancing

said polarization of said nuclear spin uses the Nuclear Overhauser Effect (NOE).

45. (previously presented) The apparatus of claim 42 wherein said device for enhancing said polarization of said nuclear spin uses optical pumping.

46. (previously presented) The apparatus of claim 42 wherein said device for enhancing said polarization of said nuclear spin uses a Spin Induced Nuclear Overhauser Effect (SPINOE).

47. (previously presented) The apparatus of claim 42 wherein said device for enhancing said nuclear spin further comprises:

(i) an arrangement for introducing a polarizing agent into said fluid; and

(ii) an arrangement for polarizing a spin of said polarizing agent,

48. (previously presented) The apparatus of claim 47, wherein said polarizing agent further comprises a noble gas

49. (previously presented) The apparatus of claim 48, wherein said polarizing agent further comprises xenon.

50. (previously presented) The apparatus of claim 42, wherein said nucleus occurring in said fluid further comprises a carbon-13 nucleus present in at least one of: i) an

aliphatic hydrocarbon , ii) an aromatic hydrocarbon, , iii) a connate formation fluid, and, (iv) a mud filtrate.

51. (previously presented) The apparatus of claim 47, wherein said polarizing said spin of said polarizing agent further comprises a spin exchange with an intermediate material.

52. (previously presented) The apparatus of claim 51 wherein said intermediate material comprises rubidium.

53. (previously presented) The apparatus of claim 51 further comprising a laser to move electrons from the S to the P quantum state of said intermediate material.

54. (previously presented) The apparatus of claim 42, further comprising:

- i) a fluid chamber;
- ii) a magnet arrangement for providing a substantially homogeneous static magnetic field in said chamber;
- iii) a transmitter for applying a radio frequency magnetic field to said fluid;
- iv) a receiver for obtaining NMR signals from said fluid in response to said radio frequency magnetic field.

55. (previously presented) The apparatus of claim 42 wherein said NMR signals further

comprise obtaining spin echo signals.

56. (previously presented) The apparatus of claim 55 further comprising:

a processor for:

(i) summing amplitudes of said spin echo measurements;

(ii) spectrally analyzing said summed amplitudes; and

(iii) determining whether aromatic hydrocarbons are present in said fluid sample by measuring an amplitude of said spectrally analyzed summed amplitudes at a first frequency shift from a ^{13}C resonant frequency and determining whether aliphatic hydrocarbons are present in said fluid sample by measuring an amplitude of said spectrally analyzed summed amplitudes at a second frequency shift from said ^{13}C resonant frequency.

57. (previously presented) The apparatus of claim 42 wherein said NMR signals comprise a free induction decay.

58. (previously presented)The apparatus of claim 57 where said processor transforms the free induction decay into a frequency spectrum for analyzing chemical composition from the chemical shift information.

59. (previously presented)The apparatus of claim 42 where said NMR signals comprise a

CW frequency spectrum for analyzing chemical composition from the chemical shift information.

60. (previously presented) The apparatus of claim 42 wherein said NMR signals are associated with a nuclear spin of ^{13}C .

61. (previously presented) The apparatus of claim 53 wherein said NMR signals are associated with a nuclear spin of ^{13}C .

62. (previously presented) The apparatus of claim 43 wherein said NMR sensor includes a transmitter that applies an RF magnetic field to said fluid at an electron spin resonance (ESR) frequency of an ESR-active agent.

63. (previously presented)The apparatus of claim 44 wherein said NMR sensor includes a transmitter that applies an RF magnetic field to said fluid at nuclear resonance frequency of hydrogen nuclei in said fluid.

64 – 75 Withdrawn

76. (previously presented) A system for obtaining nuclear magnetic resonance signals from a fluid obtained from an earth formation, comprising:

(a) a logging tool including a nuclear magnetic resonance (NMR) sensor;

(b) a conveyance device for conveying said fluid into a chamber of said (NMR) sensor;

(c) an arrangement for enhancing a polarization of a nuclear spin of a nucleus occurring in said fluid;

(d) a processor for determining from signals obtained by said NMR sensor a property of said fluid; and

(e) a conveyance device for conveying said logging tool into said earth formation.

77. (previously presented) The system of claim 76 wherein said conveyance device in (c) is selected from the group consisting of (i) a wireline, and, (ii) a drilling tubular, and, (iii) coiled tubing.

78. (previously presented)The system of claim 76 wherein said arrangement in (c) uses at least one of (i) the Overhauser Effect (OE), (ii) the Nuclear Overhauser Effect (NOE), (iii) optical pumping or (iv) Spin Polarization Induced Nuclear Overhauser Effect (SPINOE).

79. (previously presented) The system of claim 76 wherein said arrangement in (c) uses at least one of (i) a noble gas, (ii) xenon, (iii) an alkaline metal, and, (iv) rubidium.

80. (previously presented) The system of claim 76 further comprising a laser for optical pumping of one of (i) a noble gas, and, (ii) xenon.

81-86. Withdrawn